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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

NGUYEN, HOA CAO

ART UNIT PAPER NUMBER

2841

DATE MAILED: 08/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/606,633	Applicant(s) HECK ET AL.	
	Examiner Hoa C. Nguyen	Art Unit 2841	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
 4a) Of the above claim(s) 19-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>06/25/2003</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-18, drawn to a structure of a Micro-electromechanical System module and its interconnection, classified in class 257, subclass 680.
 - II. Claim 19-22, drawn to a wireless device, classified in class 455, subclass 121.
 - III. Claim 23-26, drawn to a method of receiving and transmitting through an RF-Switch Array, classified in class 333, subclass 644.
2. The inventions are distinct, each from the other because:
3. Inventions I, II and III are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case, the invention III is the process of receiving and transiting a RF signal through a module and outputting the signal from the module. This process of using the product can be practiced with a system which is not necessary containing the claimed MEMS RF switch module.

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4. Inventions II and I are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because it does not need a seal ring for patentability. The subcombination has separate utility such as the ceramic cap.

5. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, and the search required for each invention is not required for other inventions, restriction for examination purposes as indicated is proper.

6. During a telephone conversation with applicants' attorney, Mr. Anthony H. Azure on 22 July 2005 a provisional election was made without traverse to prosecute the invention of group I, claims 1-18. Affirmation of this election must be made by applicant in replying to this Office action. Claims 19-26 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

7. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim

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remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

8. The disclosure is objected to because of the following informalities: The use of word "cap" for reference 104 through out the specification is misleading because:

(a) Reference 102 is named as "MEMS die". A die can be technically considered as an independent completed component. Therefore, reference 104 can be interpreted as an interposer.

(b) As shown in figure 1, the "cap section" is actually a layer or a substrate sandwiched between the die and the printed circuit board, therefore it is also technically considered as an interposer.

(c) The MEMS die can be considered as an IC chip. The cover on top of an IC chip can also be considered as a cap. Therefore, identifying intermediate portion (104) as a "cap" is misleading.

Appropriate correction is required.

Claim Objections

9. Claims 1-7 are objected to because of the following informalities:

In claims 1-3 and 6, the "at least one via" must be changed to "a plurality of vias", in order not to contradict with the dependent claims 4 and 5 where three vias are required.

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In claims 1-4, the "at least one contact" must be changed to "a plurality of contacts", in order not to contradict with the dependent claim 5 where three contacts are required.

In claim 6, the "a first via" is confusing. Is this the same "at least one via" mentioned in claim 1? Examiner assumes not.

In claim 7, the "a second via" is confusing, because claim 1 recites one vertical via.

Appropriate correction is required.

10. Claims 10-18 are objected to because of the following informalities:

In claims 10-13 and 16-18, the "at least one vertical via" must be changed to "a plurality of vertical vias", in order not to contradict with the dependent claim 14 where three vias are required.

In claim 16, the "a first vertical via" is confusing. Is this the same "at least one vertical via" mentioned in claim 10? Examiner assumes not.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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12. Claims 1-8 and 10-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Huang et al. (U.S. Patent 6,384,353).

Regarding claim 1, Huang et al. discloses an apparatus comprising a Micro-electromechanical System (MEMS) module including:

- (a) at least one MEMS device 100, see figure 5 and abstract; and
- (b) a plurality of contacts 127, 129, and 130 mounted to a bottom of the MEMS module, see figure 5 and column 2, lines 52-54; and
- (c) A plurality of vias 140 pass vertically through a portion of the MEMS module to electrically couple the at least one MEMS device to the contacts, see figure 5 and abstract.

Regarding claim 2, Huang et al. discloses a MEMS device 100 comprising RF switches array 124 including at least one switch, see figure 5, column 2, lines 63-64.

Regarding claim 3, Huang et al. discloses input and output terminals 122 and actuation terminals 121 each electrically coupled to the MEMS device 100, see figures 5 and 6 and column 3, lines 2-5.

Regarding claim 4, Huang et al. discloses the input terminal 122 electrically coupled to a first via of the plurality of vias 140, the output terminal 122 is electrically coupled to a second via of the plurality of vias 140, and the actuation terminal 121 is electrically coupled to a third via of the plurality of vias 140, see figure 4 and column 2, lines 62-67 continuing column 3 lines 1-6.

Regarding claim 5, Huang et al. discloses the first via is electrically coupled to a first contact of the plurality of contacts 130, the second via is electrically coupled to a

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second contact of the plurality of contacts 130, and the third via is electrically coupled to a third contact 127 mounted to the bottom of the MEMS module, see figure 4 and column 2, lines 52-55.

Regarding claims 6 and 7, as shown in figure 6, Huang et al. discloses a trace ring 134 to couple the MEMS device 100 to a first via of the vias 140 and the trace ring surrounds at least a portion of the MEMS device to allow a signal to transit the MEMS module using a second via of the plurality of vias without crossing the trace ring.

Regarding claim 8, Huang et al. discloses a seal ring 113 to encapsulate the MEMS device between protective cap 150 and the bottom cap 110, see figures 5 and 6 and column 3, lines 55-57.

Regarding claim 10, Huang et al. discloses a Micro-electromechanical System (MEMS) Radio Frequency (RF) switch module comprising:

(a) a MEMS die 100 including RF switches array 124, see figure 5, column 2, lines 62-64; and

(b) a cap section 110 coupled to the MEMS die, the cap section 110 including at least one vertical via 140 to pass through the cap section, see figures 4 and 5, column 2, lines 36-37, and column 2, lines 43-46.

Regarding claim 11, Huang et al. discloses the cap section 110 which is coupled to the MEMS die by a seal ring 113, see figures 5 and 6 and column 3, lines 55-57.

Regarding claims 12 and 13, Huang et al. discloses the cap section 110 which can be made of silicon or ceramic, see column 1, lines 23-25 and lines 45-48.

Regarding claim 14, Huang et al. discloses an input terminal 122 electrically coupled to one of the RF switches array 124 and to a first via of the plurality of vias 140, the output terminal 122 is electrically coupled to the RF switch array 124 and to a second via of the plurality of vias 140, and the actuation terminal 121 is electrically coupled to the RF switches array 124 and to a third via of the plurality of vias 140, see figure 4 and column 2, lines 62-67 continuing column 3 lines 1-6.

Regarding claim 15, Huang et al. discloses a plurality of MEMS switches array 124 on surface 112 of the cap 110. It is inherently that each RF switch array needs a separate input and a separate actuation terminal for controlling the RF switch array and only one output terminal is needed for transmitting a RF signal to an antenna. Therefore, a second RF switch array must be electrically coupled to a second input terminal of the plurality of terminals 122 and to a second actuation terminal of the plurality of terminals 121, and the output of the second RF switch array is also electrically coupled to the output terminal of the first RF switch array, see column 2, lines 62-64.

Regarding claims 16 and 17, as shown in figure 6, Huang et al. discloses a trace ring 134 to couple the RF switch array 124 to a first via of the vias 140 and the trace ring surrounds at least a portion of the RF switch array 124 to allow a signal to enter or exit the MEMS RF switch module by way of a second via of the plurality of vias without crossing the trace ring.

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13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

15. Claims 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang et al. in view of Hinz et al. (U.S. Patent 6,559,530).

Regarding claims 9 and 18, Huang et al. teaches all the limitations of this claimed invention including the plurality of contacts 127, 129, and 130 for connecting to a non-MEMS module. However, Huang et al. failed to disclose or teach the printed circuit board (PCB).

Hinz et al. disclosed RF MEMS switch devices 50 with a PCB 56; see figure 3b, column 3, lines 43-45.

It would be obvious to one of ordinary skill in this art at the time of invention to have made a PCB connecting to the MEMS of Huang et al. for the functioning of the device as taught by Hinz et al.

Citation of Relevant Art

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16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Schaper et al. (Pub. No.: US 2005/0006738) discloses a structure and process for packaging RF MEMS and other devices.

Tilmans et al. (Pub. No.: US 2002/0000649) discloses a method of fabrication of a microstructure having an internal cavity.

Ma et al. (U.S. Patent 6,852,926, U.S. Patent 6,673,697, and U.S. Patent 6,903,452) discloses a packaging microelectromechanical structures.

Song (U.S. Patent 6,511,894) discloses a MEMS relay and method of fabricating the same.

Degani et al. (U.S. Patent 6,396,711) discloses interconnecting micromechanical devices.

Curtis et al. (U.S. Patent 6,914,323) discloses a method and apparatus for attaching getters to MEMS device housing.

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoa C. Nguyen whose telephone number is 571-272-8293. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hoa C. Nguyen
26 July 2005



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